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ABSTRACT

This essay discusses the effects of technological innovation on instructional innovation. It is noted that the impact of technological innovation in instruction is cushioned by inherently conservative forces in academe, including the incentive-and-reward system that rewards research over teaching as well as the reluctance of many faculty to adopt such technology. Programs at the University of Georgia and those of the Georgia Governor's Teaching Fellows Program are reviewed as examples of initiatives that support the innovative use of technology in the undergraduate classroom. The effects of learning theory on technological innovation over the last several decades are also reviewed. It is argued that while there is no best way for all students to learn, and there is no single method, process, or technique that is best for all teachers, the improvement of undergraduate education would benefit immensely from a more effective blending of learning theory, teaching practices, and the innovative uses of technology. (Contains 12 references.) (MDM)

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Teaching and Technological Innovation

by Cameron Fincher

The major challenges confronting higher education in the closing years of the 20th century are demographic, organizational, technological, and cultural change. Each has implications for learning and teaching in American colleges and universities, but none is more imposing than technological innovation.

Not only is technological change more rapid than demographic, organizational, and cultural change, but technological innovations can be the most manageable and the most promising means of educational change. Demographic and cultural change are seldom planned, directed, and managed while organizational change is more actively resisted in government and education than in business, finance, banking, and commerce where reorganization is more permissible and increased profits are an incentive.

Technological change in education has a long and interesting history. To the embarrassment of college faculties, however, there is often a reluctance to take full advantage of technological innovations that promise to make learning more efficient and more enlightening. We need only to think of time-lapse photography, 16-mm film, slide projectors, tape recorders, video-cassette players, and telecommunications (prior to the arrival of desktop computers). Each innovation was initiated with enthusiasm for the substantive change it would produce in learning and teaching effectiveness.

In both teaching and learning there was noticeable inertia in fulfilling the promise of technology in the dissemination of knowledge and the improvement of academic outcomes. Progress was made, but the extent of that progress was not what it could have been, and observable qualitative shifts in student learning seldom met the expectations of enthusiastic experts in educational technology. Indeed, each technological innovation has a way of issuing promissory notes that are difficult to redeem at full value.

Continuing Technological Innovation

Accepting the Carnegie Commission's (1972) appraisal of instructional technology as "The Fourth Revolution" in higher education, most observers would agree that the revolution has continued throughout the 1980s and 1990s. Since 1972 it has taken many unexpected turns and undergone many interesting phases. Colleges and universities have moved from multimedia classrooms, language laboratories, and computer-assisted instruction to computer-linked networks that permit individual learners to browse in the world's great libraries. Nowhere, perhaps, is the technological revolution more evident than in the remarkable transformation of libraries into learning resource centers—and in the data, information, and knowledge that can be obtained with laptop computers.

The changes technological innovation makes in knowledge, its dissemination, and its uses is being determined at the moment. As we should know from the experience of previous educators, technological innovations are neither the perfect solution nor the only solution to teaching or learning problems. Many learners do not have the technical means to benefit from the marvels of instructional technology, and far too many college instructors and university professors decline the

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opportunity to adapt innovative methods and procedures to the learning needs and interests of their students.

We need not be cynical to believe that 16-mm projectors would have had a greater impact on classroom instruction if more instructors could have learned how to thread motion picture projectors. The same may be said of 35-mm cameras and slide projectors; professors who used little discretion in what they photographed and faulty judgment in arranging their slides for presentation did not contribute to the "state of the art" in classroom instruction. Much more could be said about audio tape recorders and their role in instructional technology.

Unfortunately for student learning, many faculty members are unaware that neither technological devices nor special techniques guarantee effective teaching and learning—when unconcerted efforts are given to the development of appropriate methods, processes, or procedures in their use and application. A simple example from the distant past may be seen in the Harvard Reading Films that once promised to revolutionize reading improvement courses. By controlling fixation span and rate of reading from a motion picture screen, the Harvard Reading Films were effective in increasing the reading rate of students without lowering the level of their reading comprehension. As an instructional aid, however, the films quickly reached a "point of diminishing returns" for many readers who wanted to skim pages one at a time. Thus, the promises of a useful device for improving reading gave way to speed reading courses that promised far more than they could deliver. To a certain extent, unrealistic promises are always present in first encounters with innovative technology and eventual outcomes may be unexpected, as well as unintended.

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In higher education, the impact of technological innovation is cushioned by inherently conservative forces that often come into play. Not the least of such forces is the incentive-and-reward system that prevails for classroom instructors and other faculty members in promotion-and-tenure decisions. More than one technological or organizational innovation has been promoted on college campuses without awareness that it offered no *quid pro quo* to faculty members who must implement significant changes in institutional programs and services.

INSTRUCTIONAL DEVELOPMENT

Given the accelerated pace of technological change, the appreciable interest in the improvement of undergraduate education, and the increasing emphasis placed on learning as the major function of institutions of higher education, we have many encouraging reasons for innovative programs of faculty and/or instructional development focusing on teaching.

FACULTY DEVELOPMENT: The University of Georgia may be mentioned as one major university with a long-standing interest in both faculty development and instructional improvement. Our Faculty Development in Georgia (FDIG) program has been in effect since 1964 and involves a nice *quid pro quo* for the University of Georgia and other institutions of higher education within the state. Launched at a time of severe shortages in college faculties, the program assisted the University of Georgia in recruiting many excellent doctoral students and helped other institutions (public and private) in the professional development of dedicated faculty members. The terms were quite simple; for every year of funded doctoral study at the University of Georgia, participants then would teach a year at their home institutions.

The success of the program created considerable good will between the state's leading institution of higher learning and its sister institutions throughout the state. So much,

that when faculty shortages no longer existed no one suggested that the program be discontinued. One explanation might be the emphasis placed on the professional development of faculty members as a valuable component of their doctoral programs. For thirty-three years the program has included a weekly seminar focusing on issues related to college teaching. Another explanation might be the later visibility of FDIG participants in the state's public and private institutions.

GOVERNOR'S TEACHING FELLOWS: More recently, our Governor's Teaching Fellows (GTF) Program has been initiated as a means of: (a) continuing the commendable efforts of the FDIG program, (b) extending the efforts of the Institute of Higher Education and the Office of Instructional Support and Development in the improvement of undergraduate education in Georgia, (c) assisting Georgia faculty members who are interested in innovative methods of teaching, and (d) encouraging more effective uses of instructional technology within the state's colleges and universities. As designed and implemented, the GTF program is an effective blending of inservice development, continuing professional education, and inter-institutional cooperation.

Participants in the program are faculty members in private or public colleges located within Georgia. They are nominated by their presidents who agree to give appropriate release time and institutional support. They are selected on the basis of their teaching experience and their interest in continuing instructional development. They may participate in the program by exercising one of three options: (a) faculty members who do not have doctoral degrees may take leave and combine a year of graduate study with participation; (b) faculty members with doctorates may participate in a series of three-day symposia conducted throughout the academic year; and (c) other faculty members may participate in a two-week summer symposium concentrating more directly on the topics addressed in the academic-year symposia.

Among the symposia topics are: instructional technology as related to teaching in the sciences and in the humanities; the uses of instructional technology in facilitating student learning; teaching devices and methods in classrooms of the future; the uses of technological innovations in group presentations; and various introductions or overviews of technological innovations currently in place or on the horizon. Related topics include group problem solving, assessment techniques, curricular trends, learning styles, teaching portfolios, teaching evaluation, and instructional models of various kinds.

. . . if faculty members are to be actively involved in the improvement of undergraduate education, they must have appropriate incentives.

Participant funding for the program is provided by the Governor and the General Assembly of the State of Georgia. Included in the initial appropriation for the program were funds for additions to "state of the art classrooms" funded through other state programs of assistance in instructional development. Among the additions made with the special appropriation were: a network infrastructure for laptop computers, enhanced computer capabilities, and improved accommodations for faculty members developing advanced skills in use of presentation software and web-based instruction.

A distinctive strength of the program is the support of the governor and members of the Georgia General Assembly. Upon completion of the program, participants receive a certificate of attainment signed by Governor Zell Miller—a distinctive recognition by state leaders of a statewide need to improve undergraduate education. Other features of the program carry similar implications for the program's eventual impact on the quality of undergraduate instruction in Georgia colleges and universities.

POST-DOCTORAL TEACHING FELLOWS: Currently underway are plans by the Franklin College of Arts and Sciences to establish, in cooperation with the Institute of Higher Education, an innovative post-doctoral teaching fellows program. Recently graduated PhDs will be recruited nationally to teach undergraduate courses in departments of arts and sciences where the need for meeting undergraduate demands is essential. Teaching Scholars will be appointed as nontenure line assistant professors in their respective disciplines for terms of two or three years.

In addition to their teaching responsibilities, Teaching Scholars will participate in a program of instructional development similar to the Governor's Teaching Fellows. The objective will be to enhance instructional skills in ways similar to traditional post-doctoral experiences in developing research skills. Special assistance will be given in the integration of teaching methods and technological innovations, such as the design and development of web pages using HTML editing software and the GTF Video Streaming Toolbox Project. In all phases of the program, teaching will be presented as a form of scholarship and will assign a high priority to the improvement of undergraduate education.

THEORY AND TECHNOLOGY

In current efforts to re-direct institutional attention and efforts to the importance of teaching in American higher education, there is much that is encouraging—and there is much to re-learn about learning. Whatever the intensity or pervasiveness of the "current revolution," there are significant differences between the emphasis given teaching and learning in 1998, as compared to that observed by some of us twenty years ago (*Fincher, 1977*).

In the 1950s when learning theory was vigorous and much debated among psychologists, most faculty members were indifferent to controversial issues in learning and knew nothing of their practical implications for classroom instruction. In the 1960s faculty members teaching in packed classrooms began to take notice of the research relevant to training and development in business, industry, and military services. The applications of systems analysis, programmed instruction, audio-tutorials, and computer-based learning promised to re-individualize teaching and learning in an era of massive higher education. Standardized testing was embraced as a means of assessing, classifying, and placing students according to their capabilities and interests.

Throughout the last four decades, there have been disparities between theory as explanatory principles, and technology as planned and directed change in methods and processes.

During the 1970s many of us were enthusiastic about behavioral objectives, criterion-referenced tests, and instructional systems that can now be seen as technologically innovative but much too technocratic for permanent solutions to the problems of teaching and learning. Too many of us were overly concerned with managerial problems such as class size, developmental studies, nontraditional students, and faculty renewal. And too many faculty members neither read nor appreciated properly Pat Cross' momentous trilogy: *Beyond the Open Door* (1971); *Accent on Learning* (1976); and *Adults as Learners* (1981).

As the 1980s approached, many of us were fascinated by the possibilities of improving teaching and learning by matching teaching styles and learning strategies. Samuel Messick's *Individuality in Learning* (1976) offered a better appreciation of cognitive styles and learning strategies. Cronbach and Snow's *Aptitudes and Instructional Methods* (1977) unveiled the mysteries of interactions between student aptitudes and teaching methods. Leona Tyler's commendable blending of differential and developmental psychology in *Individuality: Human Possiblities and Personal Choice* underscored the importance

of individual purposes and development throughout life.

Unfortunately for the improvement of teaching and learning, various colleagues in other corners of the campus did not have the "technical background" to appreciate the "interactive effects" of aptitudes and methods, teaching styles and learning strategies, instructional objectives and learning outcomes. Needless to add, most students were interested in other matters and those who wrote about interactive effects wrote mostly for an enlightened but very small audience.

Throughout the last four decades, there have been disparities between theory, as explanatory principles, and technology, as planned and directed change in methods and processes. At one time, learning theory was well ahead of the technology available to college students and most teaching faculty—and on other occasions, technology has outpaced concepts and principles facilitating and explaining the effective use of teaching and learning practices. In standardized testing, for example, technology in measurement and assessment have exceeded theories of educational achievement that were acceptable to the diverse faculties in science and engineering, the humanities and fine arts, and professional fields of specialized or advanced study. The same may be said about Warren Willingham's commendable effort in *College Placement and Exemption* (1974) to interpret the educational benefits of advanced placement and course exemption. And nowhere is the disparity between theory and technology more evident than in tests of academic ability and achievement. Uninformed publics often resist the explanation of research findings even more than they do the technology of assessment.

In summary: what we should have learned in the 1970s and what we must learn again can be stated simply. If we are to use technological innovations in the improvement of student learning, we must fully engage the teaching faculties of our colleges and universities; and *if* faculty members are to be actively involved in the improvement of undergraduate education, they must have appropriate incentives. Many of us must learn again that:

- There is no best way for all students to learn. Variations in human learning are explained by differences in individual capabilities, interests, and preferences—by the different demands of conceptual, behavioral, or experiential learning—and by the intrinsic differences of academic disciplines and professional specialties. Learning strategies reflect in many ways the knowledge, competence, and understanding students have acquired prior to enrollment in our classes.

- There is no single method, process, or technique that is best for all teachers. The diversity of instructional objectives and teaching styles is related to the individual differences of instructors, their respective fields of specialization, and the various ways in which knowledge is organized for dissemination, competence is developed with supervised practice, and understanding is attained by observation and personal experience. Teaching styles, in their interaction with learning strategies, will often produce interesting—and mutually beneficial—results.

- Most of us do our best teaching when students learn how to learn—and continue learning after they have long forgotten their teachers. Indeed there is much for teaching faculty to learn in the application of learning concepts and principles to instructional technology—and teaching itself must continue to be a learning experience.

- Whatever the current emphasis on teaching and learning might be—the improvement of education in the nation's colleges and universities would benefit immensely from a more effective blending of learning theory, teaching practices, and the innovative uses of technology.

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THIS ISSUE . . .

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